

# Embedded Linux Conference Europe 2013



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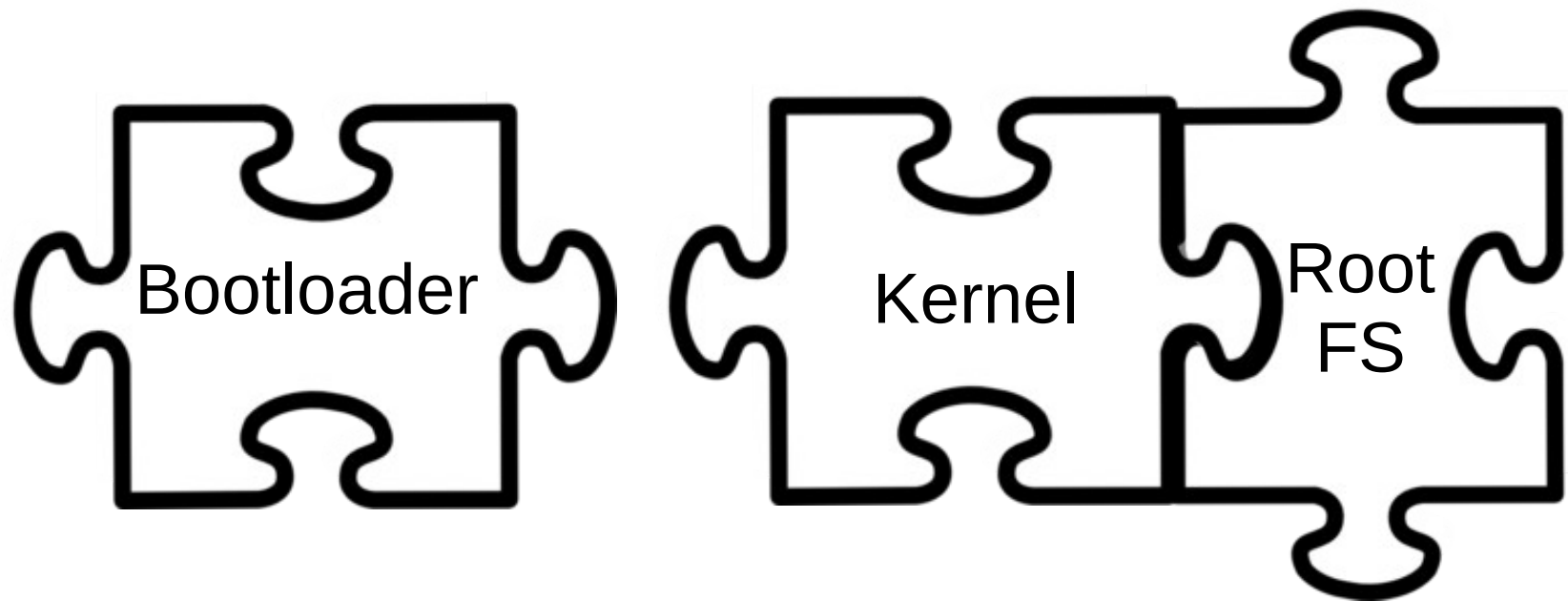


# Agenda

- Bootloader Specification
- Barebox infrastructure
  - Devicetrees in barebox
  - Multiimage
  - Goodies



# Current Arm Situation



# Current ARM distribution situation

**Freescale i.MX53qsb**

**OMAP4 PandaBoard**



**OMAP3 BeagleBoard**

**Toshiba AC100**



# Current ARM distribution situation

Intel iop32x

Intel ixp4xx



Marvell Kirkwood

Marvell Orion5x





# Current ARM distribution situation

**Trimslice**

**OMAP3 BeagleBoard xM**



**Calxeda Highbank**

**OMAP4 PandaBoard**



# Current ARM distribution situation

Always possible to manually install a distribution on a board.

Many instructions / Howtos exist for each board /  
Distribution combination

BUT

Distributions do not have general ARM support, they have support for selected ARM based boards



# Current ARM distribution situation





# Current ARM distribution situation

No board independent way to install a kernel!

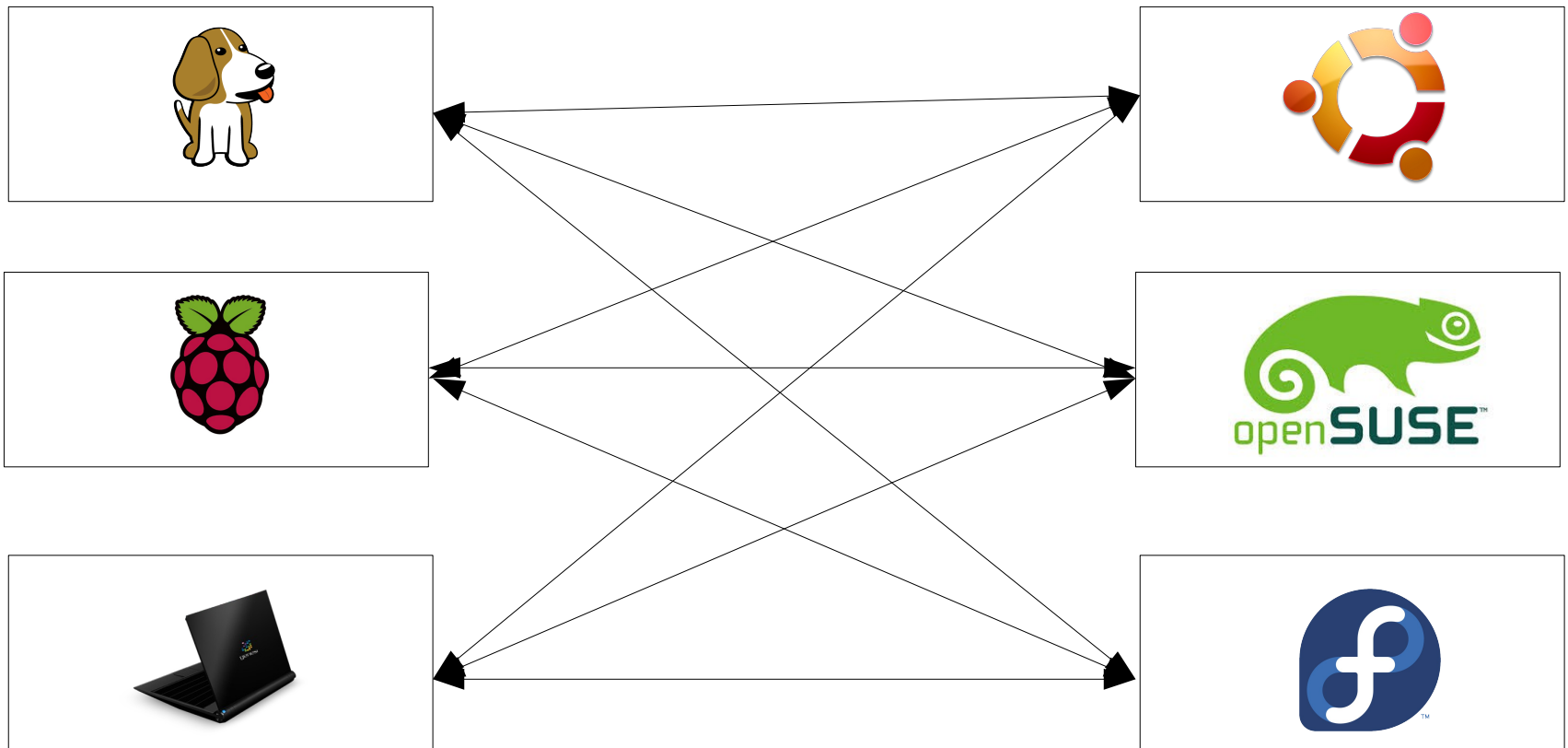
Usually only a single Kernel can be installed

Images are not portable between boards

Makes Kernel updates risky

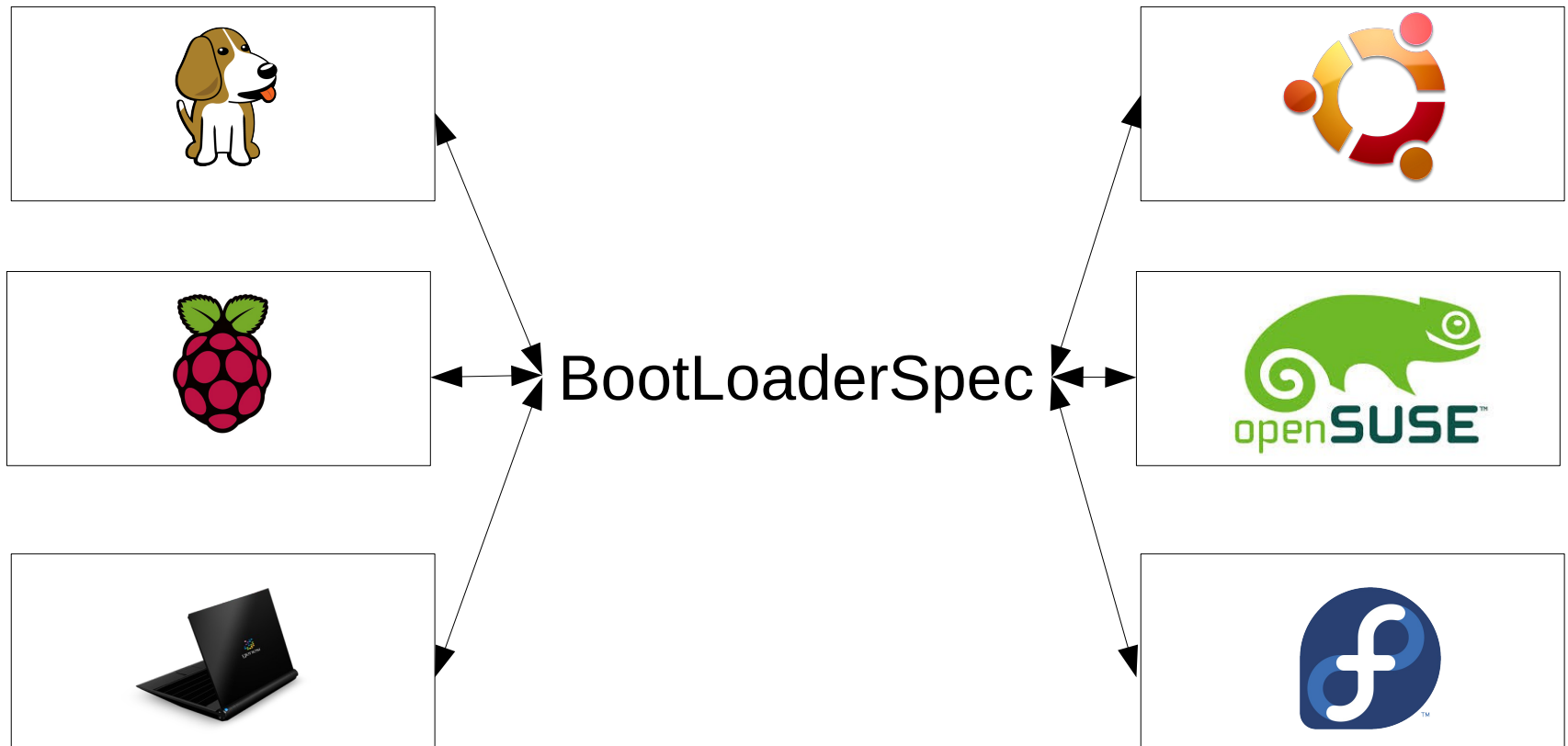


# Current ARM distribution situation



# Bootloader Specification

Fills the gap between bootloader and Kernel



# Bootloader Specification: TL;DR

<http://www.freedesktop.org/wiki/Specifications/BootLoaderSpec/>

„TL;DR: Currently there's little cooperation between multiple distributions in dual-boot (or triple, ... multi-boot) setups, and we'd like to improve this situation by getting everybody to commit to a single boot configuration format that is based on drop-in files, and thus is robust, simple, works without rewriting configuration files and is free of namespace clashes.“



# Bootloader Specification

Simple specification based on drop-in files

- Find a partition to use as /boot
- /boot/loader/entries/ contains one drop-in text file per entry
- /boot/<machine-id>/ contains kernel/initrd/devicetree files





# Bootloader Specification: find /boot

- On MBR disks:
  - Partition with type oxea
- On GPT disks:
  - Partition with GUID bc13c2ff-59e6-4262-a352-b275fd6f7172
  - Or: On UEFI systems the ESP partition is used
- /boot is shared across all installations on a device



# Bootloader Specification: example

*/boot/loader/entries/6a..98-3.8.0-2.fc19.conf:*

```
title          Fedora 19 (Rawhide)
version        3.8.0-2.fc19
machine-id     6a..98
options        root=UUID=\
               6d3376e4-fc93-4509-95ec-a21d68011da2
linux          /6a..98/3.8.0-2.fc19/linux
initrd         /6a..98/3.8.0-2.fc19/initrd
devicetree     /6a..98/3.8.0-2.fc19/oftree
```



# Bootloader Specification: kernel-install

- Delete. Create, manipulate entries

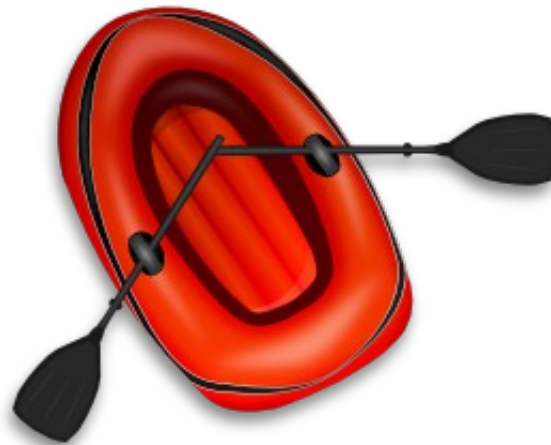
```
File Edit View Bookmarks Settings Help
root@Genesi Efika MX Smartbook:~ kernel-install -a --kernel-version="3.12-rc6" --kernel=/tmp/linuximage
written config file: /boot/loader/entries/11ab7c89d02c4f66a4e2474ea25b2b84-3.12-rc6.conf
root@Genesi Efika MX Smartbook:~
```

sha : microcom

# Bootloader Specification: Gummiboot

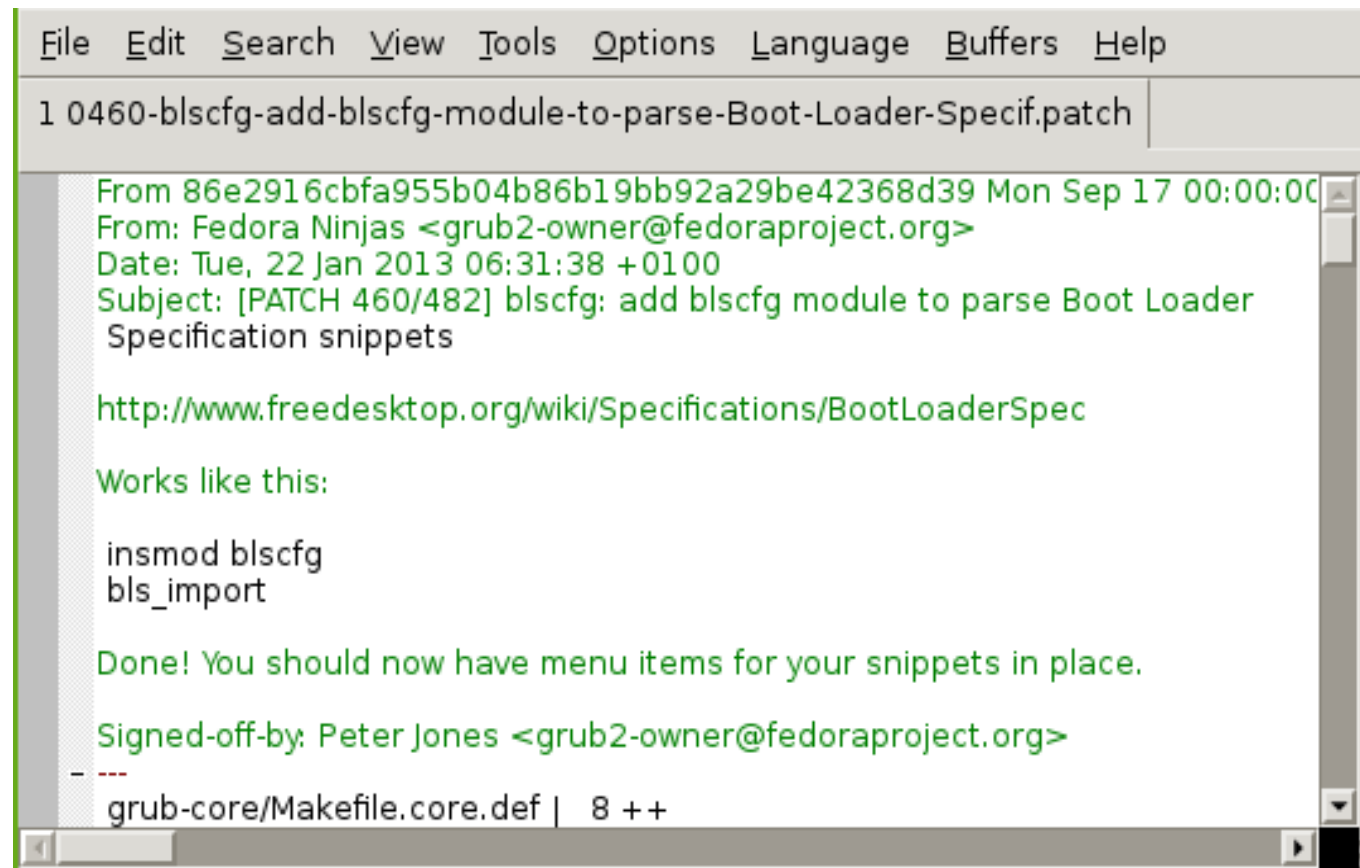
Simple UEFI Boot Manager

Written by Kay Sievers and Harald Hoyer



# Bootloader Specification: grub2

- Patch exists

A screenshot of a text editor window showing a patch file. The window has a menu bar with 'File', 'Edit', 'Search', 'View', 'Tools', 'Options', 'Language', 'Buffers', and 'Help'. The title bar reads '1 0460-blscfg-add-blscfg-module-to-parse-Boot-Loader-Specif.patch'. The patch content is displayed in green text on a white background. It includes a commit hash, date, time, and email address, followed by the subject line '[PATCH 460/482] blscfg: add blscfg module to parse Boot Loader Specification snippets'. A URL is provided: 'http://www.freedesktop.org/wiki/Specifications/BootLoaderSpec'. Below this, it says 'Works like this:' followed by two lines of code: 'insmod blscfg' and 'bls\_import'. A message follows: 'Done! You should now have menu items for your snippets in place.' The patch is signed off by 'Peter Jones <grub2-owner@fedoraproject.org>'. At the bottom, it shows the file path 'grub-core/Makefile.core.def' and the line number '8' with two plus signs indicating the end of the patch.

```
File Edit Search View Tools Options Language Buffers Help
1 0460-blscfg-add-blscfg-module-to-parse-Boot-Loader-Specif.patch

From 86e2916cbfa955b04b86b19bb92a29be42368d39 Mon Sep 17 00:00:00
From: Fedora Ninjas <grub2-owner@fedoraproject.org>
Date: Tue, 22 Jan 2013 06:31:38 +0100
Subject: [PATCH 460/482] blscfg: add blscfg module to parse Boot Loader
Specification snippets

http://www.freedesktop.org/wiki/Specifications/BootLoaderSpec

Works like this:

insmod blscfg
bls_import

Done! You should now have menu items for your snippets in place.

Signed-off-by: Peter Jones <grub2-owner@fedoraproject.org>
- ---
grub-core/Makefile.core.def | 8 ++
```



# Bootloader Specification: Your bootloader?

Implement it for your favourite bootloader!



# Bootloader Specification

- Simple and straight forward for bootloader and Linux Distributions
- As easy as generating a grub menu.lst
- Gummiboot uses BootLoaderSpec as its native format
- Grub2 patch exists for bootloaderSpec
- systemd supports BootLoaderSpec with kernel-install script
- Allows
  - installing multiple Distributions in parallel
  - installing multiple Kernels per Distro
    - > safe Kernel update
- Autodiscovery of installed Kernels allows creation of board independent SD cards / USB sticks

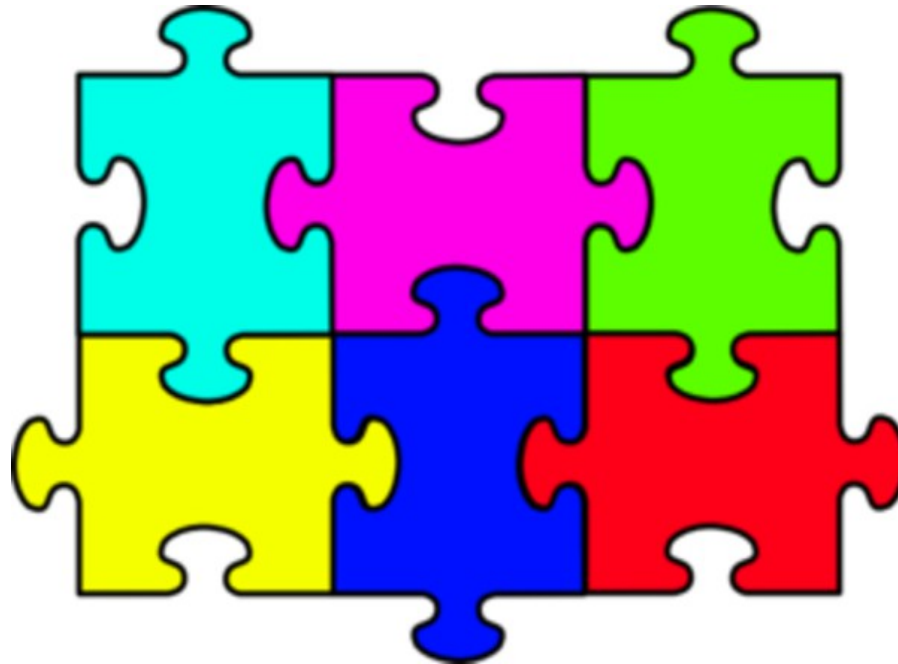


# Bootloader Specification: missing

- boot order is not part of the specification
- No support for raw NOR/NAND devices (mtd)



# barebox Infrastructure



# Devicetree

- barebox on i.MX/Tegra/SoCFPGA boards can be probed from the devicetree
- Makes ports to new boards easier: board description has to be written only once.
- The same devicetree can be used to start the kernel
- Requires some stability in the bindings





# Devicetree: devicetree changes

- barebox internal devicetree can be used to start the kernel
- Useful for generic installer images

Experience shows:

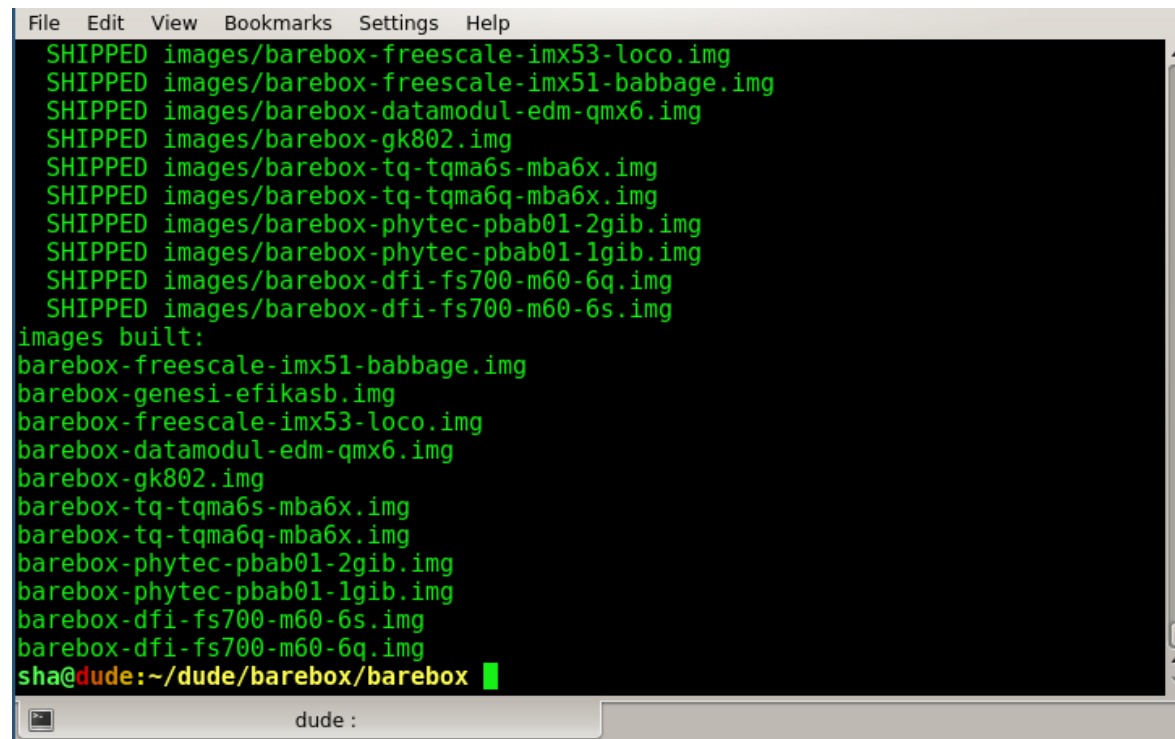
Devicetrees change with newer kernels, they must  
be replaceable

- Bootloader Spec can be used to install an updated devicetree



# Multi-image support

- The same config is built for multiple boards
- Less variants -> easier maintenance
- better compile coverage with less effort



```
File Edit View Bookmarks Settings Help
SHIPPED images/barebox-freescale-imx53-loco.img
SHIPPED images/barebox-freescale-imx51-babbage.img
SHIPPED images/barebox-datamodul-edm-qmx6.img
SHIPPED images/barebox-gk802.img
SHIPPED images/barebox-tq-tqma6s-mba6x.img
SHIPPED images/barebox-tq-tqma6q-mba6x.img
SHIPPED images/barebox-phytec-pbab01-2gib.img
SHIPPED images/barebox-phytec-pbab01-1gib.img
SHIPPED images/barebox-dfi-fs700-m60-6q.img
SHIPPED images/barebox-dfi-fs700-m60-6s.img
images built:
barebox-freescale-imx51-babbage.img
barebox-genesi-efikasb.img
barebox-freescale-imx53-loco.img
barebox-datamodul-edm-qmx6.img
barebox-gk802.img
barebox-tq-tqma6s-mba6x.img
barebox-tq-tqma6q-mba6x.img
barebox-phytec-pbab01-2gib.img
barebox-phytec-pbab01-1gib.img
barebox-dfi-fs700-m60-6s.img
barebox-dfi-fs700-m60-6q.img
sha@dude:~/dude/barebox/barebox
```



# Detect

- 'detect' unifies the different usb/mmc detect mechanisms

```
File Edit View Bookmarks Settings Help
imx-esdhc 70008000.esdhc: registered as 70008000.esdhc
mc13xxx-spi mc13892@00: Found MC13892 ID: 0x0045d0 [Rev: 2.0a]
netconsole: registered as cs1
malloc space: 0xab00000 -> 0xafdffff (size 64 MiB)
barebox-environment environment-spi.5: setting default environment path to /dev/m25p0.bare
box-environment
running /env/bin/init...
replacing internal devicetree with /env/oftree

Hit m for menu or any other key to stop autoboot: 1

type exit to get to the menu
barebox@Genesi Efika MX Smartbook:/ detect pata0
pata0: registered /dev/pata0
barebox@Genesi Efika MX Smartbook:/ detect -a
mmc1: registered mmc1
Bus 001 Device 001: ID 0000:0000 EHCI Host Controller
Found SMSC USB31x ULPI transceiver (0x0424:0x0006).
Bus 002 Device 005: ID 13d3:3273 802.11 n WLAN
usb-storage usb2-0-3: registered usbdisk0
Bus 002 Device 006: ID 0930:6545 DataTraveler G3
Bus 002 Device 003: ID 0424:2514
Bus 002 Device 002: ID 0000:0000 EHCI Host Controller
Found SMSC USB31x ULPI transceiver (0x0424:0x0006).
Bus 003 Device 008: ID 0424:2514
Bus 003 Device 007: ID 0000:0000 EHCI Host Controller
barebox@Genesi Efika MX Smartbook:/ █

sha : microcom
```



# Mount -a

- Mount all devices at once

```
File Edit View Bookmarks Settings Help
mmc1: registered mmc1
Bus 001 Device 001: ID 0000:0000 EHCI Host Controller
Found SMSC USB331x ULPI transceiver (0x0424:0x0006).
Bus 002 Device 005: ID 13d3:3273 802.11 n WLAN
usb-storage usb2-0-3: registered usbdisk0
Bus 002 Device 006: ID 0930:6545 DataTraveler G3
Bus 002 Device 003: ID 0424:2514
Bus 002 Device 002: ID 0000:0000 EHCI Host Controller
Found SMSC USB331x ULPI transceiver (0x0424:0x0006).
Bus 003 Device 008: ID 0424:2514
Bus 003 Device 007: ID 0000:0000 EHCI Host Controller
pata0: registered /dev/pata0
ext4 ext40: EXT2 rev 1, inode_size 256
ext4 ext41: EXT2 rev 1, inode_size 256
ext4 ext42: EXT2 rev 1, inode_size 256
ext4 ext43: EXT2 rev 1, inode_size 128
ext4 ext44: EXT2 rev 1, inode_size 256
none on / type ramfs
none on /dev type devfs
/dev/mmc1.0 on /mnt/mmc1.0 type fat
/dev/mmc1.1 on /mnt/mmc1.1 type ext4
/dev/mmc1.2 on /mnt/mmc1.2 type ext4
/dev/mmc1.3 on /mnt/mmc1.3 type ext4
/dev/usbdisk0.0 on /mnt/usbdisk0.0 type fat
/dev/pata0.0 on /mnt/pata0.0 type ext4
/dev/pata0.2 on /mnt/pata0.2 type ext4
barebox@Genesi Efika MX Smartbook:/
```

# misc barebox goodies

- POSIX style programming API
- Kconfig allows easy configuration
- regular file commands: rm, cp, ls, cat
- 'magicvar' shows variables with special meanings (and their meaning)
- Good infrastructure makes programming commands easier and more powerful
  - mountpoints and devices accessible as files make commands generally useful
  - getopt makes positional arguments unnecessary





# Thank you very much

website: <http://www.barebox.org>

IRC: #barebox

Project Mailing List:  
<http://lists.infradead.org/mailman/listinfo/barebox>

Sascha Hauer <[s.hauer@pengutronix.de](mailto:s.hauer@pengutronix.de)>

